Bacteria of the Melons.[1]

BYRON D. HALSTED.

Early in July there were many complaints throughout the country that the melon, squash and cucumber vines were either not doing well or dying from some unknown cause. The first specimens to arrive were from Bangor, Me., followed by others from the central part of New Jersey, a locality famous for its production of cucurbitaceous fruits.

The attacked vines vary somewhat in their appearance, but generally there is a decay of the stem in proximity to the root, and then the whole plant wilts and fails to grow. Sometimes one or more leaves will fall to the ground and rot away before the balance of the plant is seemingly affected. This is particularly true of the cantaloups, while in the case of cucumbers the fruit may be the first to show the trouble. Here the half grown cucumbers exhibit from one to a dozen or more specks looking like "water cores," which increase in size, until the whole of the fruit becomes a rotten mass, the firm skin still holding the watery interior in shape.

A microscopic examination of the decaying stems, leaves and fruit showed that the decomposing tissues were teeming with bacteria. This was to be expected, but it remained to prove that these germs could be the primary agent in the decay. Inoculations of healthy fruits were made in the usual way by means of sterilized platinum wire. taking the germs from the centre of freshly decaying cucumbers. It was found that with no other fungus present these germs were abundantly able to introduce a rapid decay into cucumbers, melons and squashes. Cucumbers seem to be the favorite, and in them the decay is the most rapid. It will run from one end to the other through the succulent centre of a four inch fruit in a single day. From the placentae the rot spreads towards the surface until all is a noisome pulp inclosed by the skin which may remain unbroken if the inoculation has been made at the stem end.

The next step in the study was the application of these germs to healthy plants in the field. This was done by means of a flamed glass tube one end of which had been drawn out into a long point. By means of this, the germs in liquid,

[1] Read before Section F, A. A. A. S., Washington meeting, August, 1891.

after being drawn into the tube, could be introduced into any part of the plant, even into the woody base of squash vines. When the inoculation was made near the end of a vine, the latter rotted away in from three to four days, and when nearer the base a longer time was required, but in all cases an ulcer was formed which spread more or less rapidly depending upon the tissue infected. In old stems the decay was almost entirely internal, and did not show much until the disease had spread through the pith to some distant soft parts. A medicine dropper was employed to place a charge in the middle of several petioles of large squash leaves. Upon the next visit, twenty-four hours after, all such leaves had fallen to the ground, and the portion of the petioles below the point of inoculation, six or more inches in some cases, were thoroughly decayed. In short, the bacterial disease first found in the cucumber and afterwards propagated from fruit to fruit in the laboratory, as also upon cut stems and petioles, is readily transmitted to vigorous living vines of the cucumber and squash in the field.

Sixteen seeds of summer crooked squash were divided into two equal lots, and each set of eight planted in a flower pot under a bell jar and in every way treated alike, except that the soil of one pot was watered at the beginning of the experiment with the juice of a cucumber which had decayed with bacteria. The eight seeds not receiving the bacterial liquid germinated quickly producing large, deep green plants, while in the other pot only two plants appeared above ground, and they were of a dwarfed, sickly, yellow color, and did not continue to grow. These two plants were quite close to the side of the pot and did not receive a full wetting by the bacterial water. The remaining six seeds when removed from the soil were decayed and noisome.

Eight seeds were next placed upon blotting paper, moistened with distilled water, and kept covered in a small artist's saucer, while a duplicate set were similarly placed, but wet with a solution containing bacteria from a decaying cucumber. Here again the untreated seeds all grew with usual vigor, while those in contact with the bacterial germs failed to germinate and soon decayed.

The pure virus was next introduced into the growing stems and green fruits of the tomato, and in both cases quickly produced a decay that caused the stems to fall and the fruit to

become a watery mass inclosed by the skin, similar to the cucumber from which the bacteria were taken for inoculation. At the time of the experiments some boxes of young tomato plants were close at hand, and into the centre of one of these a decaying cucumber was placed. In six hours some of the stems of the tomato plants six inches in height had rotted off close to the ground, where the liquid from the decaying fruit had come in contact with the young plants. In ten hours all the plants in the vicinity of the decaying cucumber were destroyed. Drops of the virus placed in the leaf axil of other plants quickly induced decay and death of the parts.

The virus from a cucumber was also used upon potato vines in the same manner as upon the squashes, but both the extreme age of the plants and the dry weather may have been unfavorable, as the decay was slow and comparatively harmless. Healthy tubers, however, when inoculated with the cucumber bacteria rotted with that rapidity characteristic of the bacterial decay of the potato. In all cases the tuber became of a pasty softness, and gave off a most unpleasant odor. This decaying substance when taken back to fresh fruit of the cucumbers continued to produce rapid decay.

Rutgers College, New Brunswick, N. J.

Interesting anatomical and physiological researches.

The leaves of aquatic monocotyledons.

M. Camille Sauvageau has just brought to a conclusion his noteworthy memoir[1] on the leaves of some aquatic monocotyledons. To the physiologist this contribution to a little known department of botanical science is no less interesting than to the morphologist. The studies of the author have been principally upon the *Potamogetonaceæ* (see Ascherson's monograph in Engler and Prantl: *Die natürlichen Pflanzenfamilien)*, and for the forty-eight species examined he announces that the histological characters of the leaf alone will be sufficient for identification. He finds, moreover, in *Zoste-*

[1] Ann. Sci. Nat., Botanique, 7. 13, pp. 102–296; *Sur les feuilles de quelques monocotyledones aquatiques.*